Table 12.6a – Sulfur Dioxide, Nitrogen Oxide, and Carbon Dioxide Emission Factors, 2003 - Electricity Generators

Fuel	Boiler Type/ Firing Configuration	Emission Factors		
		Sulfur Dioxide [1]	Nitrogen Oxides [2]	Carbon Dioxide [3]
Electricity Generators				
Coal and Other Solid Fuels		lbs per ton	lbs per ton	lbs per 10^6 Btu
Petroleum Coke[4]	fluidized bed[5]	39.0 x S	21	225.13
	all others	39.0 x S	21	225.13
Refuse	all types	3.9	5	199.82
Wood	all types	0.08	1.5	0
Petroleum and Other Liquid Fuels		lbs per 10^3 gal	lbs per 10^3 gal	lbs per 10^6 Btu
Resudual Oil[6]	tangential	157.0 x S	32	173.72
	vertical	157.0 x S	47	173.72
	all others	157.0 x S	47	173.72
Distillate Oil[6]	all types	150.0 x S	24	161.27
Methanol	all types	0.05	12.4	138.15
Propane (liquid)	all types	86.5	19	139.04
Coal-Oil Mixture	all types	185.00 x S	50	173.72
Natural Gas and Other Gaseous Fuels		lbs per 10^6 cf	lbs per 10^6 cf	lbs per 10^6 Btu
Natural Gas	tangential	0.6	170	116.97
	all others	0.6	280	116.97
Blast Furnance Gas	all types	950	280	116.97

Source: EIA, Electric Power Annual 2003, DOE/EIA-0348(2003) (Washington, D.C., December 2004) Table A1

Notes:

[1] Uncontrolled sulfur dioxide emission factors. "x S" indicates that the constant must be multiplied by the percentage (by weight) of sulfur in the fuel. Sulfur dioxide emission estimates from facilities with flue gas desulfurization equipment are calculated by multiplying uncontrolled emission estimates by one minus the reported sulfur removal efficiencies. Sulfur dioxide emission factors also account for small quantities of sulfur trioxide and gaseous sulfates.

[2] Parenthetic values are for wet bottom boilers; otherwise dry bottom boilers. If bottom type is unknown, dry bottom is assumed. Emission factors are for boilers with a gross heat rate of 100 million Btu per hour or greater.

[3] Uncontrolled carbon dioxide emission estimates are reduced by 1% to account for unburned carbon.

[4] Emission factors for petroleum coke are assumed to be the same as those for anthracite. If the sulfur content of petroleum coke is unknown, a 6 percent sulfur content is assumed.

[5] Sulfur dioxide emission estimates from fluidized bed boilers assume a sulfur removal efficiency of 90%.

[6] Oil types are categorized by Btu content as follows: heavy (greater than or equal to 144,190 Btu per gallon), and light (less than 144,190 Btu per gallon). cf = Cubic Feet. gal = U.S. Gallons. lbs = Pounds.

Table 12.6b – Sulfur Dioxide, Nitrogen Oxide, and Carbon Dioxide Emission Factors, 2003 - Combined Heat and Power Producers

Fuel	Boiler Type/ Firing Configuration	Emission Factors		
		Sulfur Dioxide [1]	Nitrogen Oxides [2]	Carbon Dioxide [3]
Coal and Other Solid Fuels		lbs per ton	lbs per ton	lbs per 10^6 Btu
Peat.	all types	30.00 x S	12	0
Agricultural Waste	all types	0.08	1.2	0
Black Liquor	all types	7	1.5	0
Chemicals	all types	7	1.5	0
Closed Loop Biomass	all types	0.08	1.5	0
Internal	all types	0.08	1.5	0
Liquid Acetonitrile Waste	all types	7	1.5	150.76
Liquid Waste	all types	2.8	2.3	163.29
Municipal Solid Waste	all types	1.7	5.9	189.48
Petroleum Coke	all types	39.00 x S	14	225.13
Pitch	all types	30.00 x S	11.1	0
RailRoad Ties	all types	0.08	1.5	0
Red Liquor.	all types	7	1.5	0
Sludge	all types	2.8	5	0
Sludge Waste	all types	2.8	5	0
Sludge Wood	all types	2.8	5	0
Spent Sulfite Liquor	all types	7	1.5	0
Straw	all types	0.08	1.5	0
Sulfur	all types	7	0	0
Tar Coal	all types	30.00 x S	11.1	0
Tires	all types	38.00 x S	21.7	0
Waste Byproducts	all types	1.7	2.3	163.29
Waste Coal	all types	38.00 x S	21.7	0
Wood/Wood Waste	all types	0.08	1.5	0
Petroleum and Other Liquid Fuels		lbs per 10^3 gal	lbs per 10^3 gal	lbs per 10^6 Btu
Heavy Oil[4]	all types	157.00 x S	47	173.72
Light Oil[4]	all types	142.00 x S	20	159.41
Diesel	all types	142.00 x S	20	161.27
Kerosene	all types	142.00 x S	20	159.41
Butane (liquid)	all types	0.09	21	143.2
Fish Oil	all types	0.5	12.4	0
Methanol	all types	0.5	12.4	138.15
Oil Waste	all types	147.00 x S	19	163.61
Propane (liquid)	all types	0.5	19	139.04
Sludge Oil	all types	147.00 x S	19	0
Tar Oil	all types	162.70 x S	67	0
Waste Alcohol	all types	0.5	12.4	138.15

Natural Gas and Other Gaseous Fuels		lbs per 10^6 cf	lbs per 10^6 cf	lbs per 10^6 Btu
Natural Gas	all types	0.6	280	116.97
Butane (Gas)	all types	0.6	21	143.2
Hydrogen	all types	0	550	0
Landfill Gas	all types	0.6	550	115.12
Methane	all types	0.6	550	115.11
Other Gas	all types	0.6	550	141.54
Propane (Gas)	all types	0.6	19	139.04

Source: EIA, Electric Power Annual 2003, DOE/EIA-0348(2003) (Washington, D.C., December 2004) Table A1

Notes:

[1] Uncontrolled sulfur dioxide emission factors. "x S" indicates that the constant must be multiplied by the percentage (by weight) of sulfur in the fuel. Sulfur dioxide emission estimates from facilities with flue gas desulfurization equipment are calculated by multiplying uncontrolled emission estimates by one minus the reported sulfur removal efficiencies. Sulfur dioxide emission factors also account for small quantities of sulfur trioxide and gaseous sulfates.

[2] Parenthetic values are for wet bottom boilers; otherwise dry bottom boilers. If bottom type is unknown, dry bottom is assumed. Emission factors are for boilers with a gross heat rate of 100 million Btu per hour or greater.

[3] Uncontrolled carbon dioxide emission estimates are reduced by 1% to account for unburned carbon.

[4] Oil types are categorized by Btu content as follows: heavy (greater than or equal to 144,190 Btu per gallon), and light (less than 144,190 Btu per gallon). cf = Cubic Feet. gal = U.S. Gallons. lbs = Pounds.